UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/560,927 | 11/10/2006 | Alexander Grant | 1487.0660000 | 4076 |

26111 7590 01/08/2010

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

| EXAMINER | |
|---|---|
| HUANG, DAVID S | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2611 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 01/08/2010 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/560,927 | GRANT, ALEXANDER | |
| | Examiner | Art Unit | |
| | DAVID HUANG | 2611 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *19 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-15 and 17-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15 and 17-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/19/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Information Disclosure Statement*

1. The references listed in the Information Disclosure Statement(s) filed on 10/19/2009 have been considered by the examiner (see attached PTO-1449 form or PTO/SB/08A and 08B forms).

### *Response to Arguments*

2. Applicant's arguments, with respect to objections to claims 1-9 have been fully considered and are persuasive. The objection of 6/23/2009 has been withdrawn.

3. Applicant's arguments with respect to the objections to claims 17-25 have been fully considered but they are not persuasive. The objection of claim 17 remains. Claims 18-25 depend on claim 17.

4. Applicant's arguments, with respect to §112 matters have been fully considered and are persuasive. The §112 rejections of 6/23/2009 have been withdrawn.

5. Applicant's arguments with respect to the §101 rejection of claims 15-16 have been fully considered and are persuasive with respect to §101, but raise new issues under §112. Claim 16 is canceled. Claim 15 has been amended to recite "a computer program product embodied on a computer usable medium," but no "computer usable medium" is mentioned in the original disclosure. Such a limitation is considered to be new matter, as addressed in the rejection below.

6. Applicant's arguments with respect to the §103 rejection of the claims have been fully considered but they are not persuasive.

Applicant's argument: The Wei patent appears to be directed to double weighting parallel interference cancellation in a CDMA system wherein a RAKE receiver takes into account multipath fading relying on time delays between signal components. The time delays, or relative

timings, between the signal components disclosed in the Wei patent are not the estimated timings of the transmissions, as claimed. While the RAKE receiver disclosed in the Wei patent appears to make channel estimations (see Fig. 2), which the Examiner has taken to be the claimed timing estimates, the channel estimations are estimates of the channel of the transmission, not estimates of the timing of the transmission.

Examiner's response: RAKE receivers inherently estimate the timing of the multipaths transmissions in order to exploit path diversity in transmission reception. The claimed timing of the transmissions is not patentably distinguishable from the inherent estimated timing in RAKE receivers. As such, the RAKE receiver of the Wei patent properly discloses estimating the timings of the transmissions as claimed.

### *Claim Objections*

7. Claims 1-9 and 17-25 are objected to because of the following informalities:

Claim 17, line 4, "the timing" should be --a timing--.

Claims 18-25 are dependent on claim 17 and are similarly objected.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. Claim 15 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The recited "computer usable medium" recited in claim 15, line 2, is not disclosed in the specification as originally filed. As such, such a limitation is considered to be new matter.

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. **Claims 1-3, 5-12, 14-19, 21-28, and 30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wei et al. (US 7,321,581) in view of Fuller et al. (US 2003/0095590).

Regarding **claims 1 and 17**, Wei et al. discloses a method of estimating a timing of a first transmission received with a second transmission as a combined signal over a multiple access interference channel (MAI, col. 1, line 21), comprising:

a. estimating the timing of the second transmission (User 2 Signal, RAKE receiver outputs channel estimation (timing estimation inherent in RAKE receivers), Fig. 4);

b. demodulating, decoding and remodulating the second transmission, on the basis of the estimated timing of the second transmission, to generate an estimate of the second transmission

(soft decision 8, signal regenerator 5 both receive channel estimation and despread results from RAKE 3, despread results inherently use timing estimates in RAKE combining, Fig. 4);

c. cancelling the estimate of the second transmission from the combined signal to generate an estimate of the first transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, line 13); and

d. estimating the timing of the first transmission from the estimate of the first transmission (inherent timing estimation in RAKE of following PIC stage, col. 13, lines 14-28, Fig. 4; See Fig. 1 for repeating PIC structure).

However, Wei et al. fails to expressly disclose demodulating the second transmission on the basis of the estimated timing of the second transmission.

Fuller et al. discloses a similar parallel interference cancellation apparatus and method that performs channel estimation prior to RAKE demodulation, and uses provides the channel estimation to the RAKE demodulator 68 and regeneration block 74 (Fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art to modify Wei et al. such that RAKE demodulation is performed based on the channel estimation, since such a modification is suggested by the similar interference cancellation taught by Fuller et al. (Fig. 2).

Regarding **claims 2 and 18**, Wei et al. discloses everything applied to claims 1 and 17, and further discloses the cancelling of the estimate of the second transmission is weighted according to a probability of the estimate (f is the reliability coefficient for decision result a; col. 10, line 59 - col. 11, line 33).

Regarding **claims 3 and 19**, Wei et al. discloses everything applied to claims 2 and 18, and further discloses the probability of the estimate is calculated using a soft decoding technique to decode the second transmission (soft decision maker 8, col. 10, lines 59-65, Fig. 4).

Regarding **claim 5 and 21**, Wei et al. discloses everything applied to claims 1 and 17, and further disclose:

e. demodulating, decoding and remodulating the first transmission (User 1 signal, Fig. 4), on the basis of the estimated timing of the first transmission, to generate an estimate of the first transmission (soft decision 8, signal regenerator 5 both receive channel estimation from RAKE 3, Fig. 4, in PIC structure of the next stage; col. 13, lines 14-20; see Fig. 1);

f. cancelling the estimate of the first transmission from the combined signal to generate an estimate of the second transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, PIC structure of next stages is processes in the same way, line 13; col. 13, lines 14-20); and

g. estimating the timing of the second transmission from the estimate of the second transmission (RAKE of following PIC stage implements channel estimation, col. 13, lines 14-28, Fig. 4; See Fig. 1 for repeating PIC structure).

Regarding **claims 6 and 22**, Wei et al. discloses everything applied to claims 5 and 21, and further discloses repeating steps b to g so as to obtain improved estimates of the timings of the first and second transmissions (Fig. 1, for repeating PIC structure; col. 3, line 62 - col. 4, line 3; removes MAI on expected users by other users).

Regarding **claims 7 and 23**, Wei et al. discloses everything applied to claims 5 and 21, and further discloses the combined signal includes one or more further transmissions (Fig. 4, Users 1, 2..N signals).

Regarding **claims 8 and 24**, Wei et al. discloses everything applied to claims 7 and 23, and further discloses

step a includes estimating the timing of the one or more further transmissions, step b includes demodulating, decoding and remodulating the one or more further transmissions, on the basis of the respective estimated timing of the one or more further transmissions, to generate an estimate of the one or more further transmissions, and step c includes cancelling the estimate of the one or more further transmissions from the combined signal to generate an estimate of the first transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, line 13; Fig. 1).

Regarding **claims 9 and 25**, Wei et al. discloses everything applied to claims 8 and 24, and further discloses step f includes cancelling the estimate of the one or more further transmissions from the combined signal to generate the estimate of the second transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, line 13; Fig. 1).

Regarding **claims 10 and 26,** Wei et al. discloses a method of estimating the timings of a plurality of transmissions received as a combined signal over a multiple access channel, comprising:

a. estimating the timings of each of the plurality of transmissions (Users 1-N, RAKE receiver outputs channel estimation (timing estimation inherent in RAKE receivers) for each user, Fig. 4);

b. soft demodulating, soft decoding and soft remodulating current estimates of each of the plurality of transmissions, on the basis of their respective estimated timings, to generate soft estimates of each of the transmissions (soft decision 8, signal regenerator 5 both receive channel estimation from RAKE 3, despread results inherently use timing estimates in RAKE combining, Fig. 4);

c. updating the current estimates of each of the transmissions by cancelling the soft estimates of the other transmissions from the combined signal (MAI estimation and partial interference cancellation 6, Fig. 4, col. 12, line 51 - col. 13, line 13);

d. estimating the timings of each of the transmissions from the respective current estimates of the transmissions (inherent timing estimation in RAKE of PIC structure of next stage, Fig. 4, col. 13, lines 14-21); and

e. repeating steps b to e to obtain progressive estimates of the timings of each of the transmissions (col. 13, lines 13-21, Fig. 4; Fig. 1).

However, Wei et al. fails to expressly disclose demodulating the second transmission on the basis of the estimated timing of the second transmission.

Fuller et al. discloses a similar parallel interference cancellation apparatus and method that performs channel estimation prior to RAKE demodulation, and uses provides the channel estimation to the RAKE demodulator 68 and regeneration block 74 (Fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art to modify Wei et al. such that RAKE demodulation is performed based on the channel estimation, since such a modification is suggested by the similar interference cancellation taught by Fuller et al. (Fig. 2).

Regarding **claims 11 and 27**, Wei et al. discloses everything applied to claims 10 and 26, and further discloses steps a to e are repeated until a predetermined condition is satisfied (multiple PIC stages with a "last stage", col. 13, lines 14-25, Figs. 3 and 4; a "last stage" stage implicitly discloses a fixed number of iterations or stages in the PIC receiver, and would be a satisfied predetermined condition, once a signal reaches the end of the chain).

Regarding **claims 12 and 28**, Wei et al. discloses everything applied to claims 11 and 27, but fail to expressly disclose outputting the soft decoded current estimates.

Fuller et al. discloses the output of the symbol decision step is output (symbol decision block 70, Fig. 2) in addition to being fed back for weighting and regeneration.

Therefore, it would have been obvious to one of ordinary skill in the art to modify the Wei et al. to specify outputting the symbol decision output, since Fuller et al. discloses a similar interference cancellation circuit that performs symbol decision output and thus suggests such an implementation (Fig. 2).

Regarding **claims 14 and 30**, Wei et al. discloses everything applied to claims 10 and 26, but fails to expressly disclose the timing estimation steps are performed using coherent detection.

Fuller et al. discloses channel estimation is accomplished using a "fast" cyclic correlator using the extracted midamble (page 3, [0027], Fig. 2).

Because both Wei et al. and Fuller et al. disclose techniques for channel estimation, it would have been obvious to one of ordinary skill in the art to substitute one channel estimation teaching for the other for the predictable result of accomplishing channel estimation using a correlator and extracted midamble data.

Regarding **claim 15**, Wei et al. discloses everything applied to the method of claim 10, but fails to expressly disclose a computer program product embodied on a computer usable medium comprising computer readable program code for performing the method of claim 10 when executed.

Fuller et al. discloses using hardware, software, or a combination thereof, to implement the structure and functionality of an interference cancellation technique (pages 2-3, [0025], [0050]).

Therefore, it would have been obvious to one of ordinary skill in the art to specify a computer program for performing the interference cancellation technique of Wei et al. and Fuller et al. since it allows flexibility in implementation using hardware, software, or a combination of the two, and a software implementation is suggested by Fuller et al.

13. **Claims 4 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wei et al. (US 7,321,581) in view of Fuller et al. (US 2003/0095590) as applied to claims 2 and 18 above, and further in view of Wang (US 2004/0174939).

Regarding **claim 4 and 20**, Wei et al. and Fuller et al. disclose everything applied to claims 2 and 18, but fail to expressly disclose the probability of the estimate is calculated using a soft demodulating technique to demodulate the second transmission.

Wang discloses a novel class of receivers in which soft demodulators and soft outer channel decoders exchange information to successively improve receiver performance. When the channel is unknown and estimated by using pilot symbols, the decoded code bits with high reliability can act as pilots for channel re-estimation. Iterative channel estimation and data

detection further improves receiver performance (page 1, [0010]). At the output of the soft demodulator 210 are the a posteriori symbol probabilities (page 3, [0043], Fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to provide the Wei et al. and Fuller et al. with the soft demodulator that outputs symbol probabilities taught by Wang since it improves receiver performance.

14. **Claims 13 and 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wei et al. (US 7,321,581) in view of Fuller et al. (US 2003/0095590) as applied to claims 10 and 26 above, and further in view of McCarty (US 2203/0016622).

Regarding **claims 13 and 29**, Wei et al. and Fuller et al. disclose everything applied to claims 10 and 26, but fail to expressly disclose the timing estimation steps are performed using differential detection.

Nevertheless, Fuller et al. discloses a coherent detection in that channel estimation is accomplished using a "fast" cyclic correlator using the extracted midamble (page 3, [0027], Fig. 2).

McCarty discloses differential detection does not perform any channel estimation, and would thereby reduce complexity and eliminating the need for any pilot tones or other reference encoding techniques. Rather, differential detection compares each transmitted carrier state with another to establish a change in phase (timing information) between the two (page 1, [0009]).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the system of Wei et al. and Fuller et al. to obtain phase information (timing information) using

differential detection instead of coherent detection techniques, since it reduces complexity and eliminates the need for pilot tones.

***Conclusion***

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tran (US 6,269,075) discloses conventional RAKE receivers estimating timing delay (col. 1, line 66 - col. 2, line 3).

Huang et al. (US 6,370,129) discloses a similar RAKE implementation using both timing and channel estimation (Fig. 13) used in conjunction with MUD.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID HUANG whose telephone number is (571)270-1798. The examiner can normally be reached on Monday - Friday, 8:00 a.m. - 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on (571) 272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DSH/dsh
12/31/2009
/David Huang/
Examiner, Art Unit 2611
/Shuwang Liu/
Supervisory Patent Examiner, Art Unit 2611